05 November 2001

CRUISE RESULTS

Gulf of Maine Northern Shrimp Survey

July 23 - August 4, 2001

Introduction

This report summarizes results of the 2001 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the eighteenth cruise conducted by the Northeast Fisheries Science Center (NEFSC) in cooperation with the Northern Shrimp Technical Committee of the Atlantic States Marine Fisheries Commission. The survey is designed to provide data required for annual stock assessments and related tasks.

Methods

The survey cruise was conducted between July 23-August 4 aboard the R/V GLORIA MICHELLE, a 65-foot, 96 gross registered ton (GRT) stern trawler powered by a 365 horsepower Caterpillar diesel engine. Fieldwork was overseen by NEFSC staff. Participants included Technical Committee members and other personnel from the NEFSC and state agencies of Maine and Massachusetts (see Appendix I). Data entry and analyses were performed at the NEFSC.

A stratified random sampling design was used (Figure 1). Stations were allocated to strata roughly in proportion to the area of the strata and additional non-random stations were also occupied. Field work was conducted during daylight hours to account for diel changes in northern shrimp availability. The survey was comprised of three parts; Part I was during 23-27 July; Part II, 28-31 July; Part III, 1-4 August 2001. The vessel departed Woods Hole, MA and headed to Boothbay Harbor, ME; Boothbay Harbor, ME to Gloucester, MA, and Gloucester, MA returning to Woods Hole, MA. Locations of stations sampled during each part are given in Figure 2.

At each station a 15 minute tow was made at a vessel speed of two knots. Gear consisted of a four-seam modified commercial shrimp trawl fished at a scope of 3:1 in depths up to and including 85 fathoms; in depths between 85-100 fathoms, 250 fathoms of wire was used; and in depths greater than 100 fathoms, the scope was 2.5:1. Reference/hull surface temperatures and meteorological observations were recorded at each station. A minilogger, Sea-Bird Electronics Temperature/Pressure recorder (SBE 39) was used to record the bottom temperatures during the survey.

In all instances where feasible, a 2 kilogram (kg) sample of pandalid shrimp was collected for determination of species composition. Length frequency measurements were collected for northern shrimp (mid-dorsal carapace length, rounded down to the nearest 0.5 millimeter) in addition to sex and female spawning condition (Rasmussen 1953; McCrary 1971). In cases in which less than 2 kg of shrimp were caught, the entire catch was processed as described above.

For other species of invertebrates and finfish, standard NEFSC bottom trawl survey techniques (Azarovitz 1981, Grosslein 1969) were used to process the catch. Bony fish were measured (nearest centimeter (cm) to the end of the central caudal ray; American lobster were measured in millimeters (mm) from eye socket to end of carapace; and carapace width (cm) was recorded for crabs. Bivalves were measured by shell height (cm) and cephalopods were measured by mantle length (cm). All species weights were recorded to the nearest 0.1 kg. The remainder of the catch (miscellaneous invertebrates, trash, etc.) was recorded by weight. Total weight and sample length frequencies for each species were recorded on standard NEFSC Bottom Trawl Survey forms, which were retained for processing and computer entry.

Results

A total of 57 stations were occupied. Northern shrimp were taken at 53 stations (Table 1). There were 15 non-random fixed stations. On stratum-tow 7-1, the tow was repeated as stratum-tow 7-6, due to crossed doors. On stratum-tow 7-4, the tow was repeated as stratum-tow 7-7, due to strong currents. Strata 1, tows 1, 3, 7, and 8 and strata 3, tow 2, and strata 6, tow 10 had the highest total number of shrimp for the survey (Table 1).

All survey data for northern shrimp, and data for other Pandalid species (total weight and number) have been key-entered, audited, and archived in computer data files, together with data for finfish and selected invertebrates (total weight, number, and length frequencies). Scientific sample collections are summarized in Table 2. This information is available on request (refer to NEFSC Survey Master Data files Cruise Code 2170).

REFERENCES

Azarovitz, T. R. 1981. A brief historical review of the Woods Hole Laboratory trawl survey time series. Can. Spec. Publ. Fish. Aquat. Sci., 58: 62-67.

Grosslein, M. D. 1969. Groundfish survey methods. NMFS, Woods Hole, Lab. Ref. Doc. 69-2, 34p.

McCrary, J. A. 1971. Sternal spines as a characteristic for differentiating between females of some Pandalidae. J. Fish. Res. Board Can., 28: 98-100.

Rasmussen, B. 1953. On the geographical variation in growth and sexual development of the deep-sea prawn (Pandalus borealis kr.). Norway Fish. Mar. Invest. Rep., 10 (3); 1-160.

Table 1. Summary of station and northern shrimp collected on the 2001 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 23-August 4, 2001.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp(C)	Weight (kg)	Total No.	Total >=22 mm
01-01	46	42 48	70 23	113	4.1	43.1	5,794	2,772
01-02	44	42 55	70 21	144	4.5	13.1	1,595	883
01-03	41	42 57	70 08	110	4.2	20.5	3,047	809
01-04	31	43 15	70 02	134	5.4	13.7	2,105	561
01-05	43	43 03	70 18	135	4.7	13.4	1,682	871
01-06	32	43 13	70 16	104	4.5	0.2	34	6
*01-07	42	42 58	70 15	159	4.8	31.0	3,954	1,667
*01-08	45	42 52	70 29	108	4.1	21.4	3,188	1,348
01-09	33	43 02	70 01	126	5.4	0.3	65	0
02-01	48	42 32	70 25	112	4.7	5.8	1,033	277
02-02	47	42 24	70 30	91	4.7	20.6	2,555	1,207
03-01	37	42 54	69 42	170	6.9	3.6	386	239
03-02	30	43 17	69 55	148	6.3	23.1	3,159	1,331
03-03	36	42 58	69 34	159	6.1	6.5	973	287
03-04	27	43 22	69 54	163	6.5	9.8	1,171	553
*03-05	28	43 21	69 57	155	6.5	13.8	1,656	644
03-06	23	43 27	69 31	161	5.9	0.0	0	0
03-07	29	43 25	69 59	135	5.6	2.1	318	92
03-08	26	43 15	69 31	143	5.2	17.9	2,560	720
03-09	22	43 33	69 36	154	5.1	5.9	782	455
*03-10	34	43 06	69 48	157	6.7	11.8	1,394	733
04-01	49	42 38	69 58	183	6.8	0.6	100	20
05-01	40	42 48	69 52	227	7.4	4.2	543	242
05-02	35	42 60	69 48	181	7.2	4.2	598	140
*05-03	38	42 54	69 45	203	7.4	2.7	324	177
05-04	39	42 47	69 38	221	7.3	5.9	830	258
06-01	18	43 34	69 04	135	5.4	4.8	564	270
06-02	50	42 45	69 25	168	6.9	3.4	466	199
06-03	20	43 29	69 12	161	5.4	4.8	590	295
06-04	21	43 28	69 14	166	5.4	2.1	230	96
06-05	11	43 02	69 16	166	5.9	10.4	1,210	567
06-06	19	43 32	69 04	110	5.4	0.0	6	0
06-07	12	42 52	69 03	188	6.3	7.7	1,015	341
06-08	10	43 06	69 10	168	5.7	14.7	1,749	826
06-09	08	43 09	69 04	170	6.6	9.0	1,114	450
06-10	25	43 13	69 24	165	5.6	36.3	5,842	1,068

Table 1. (continued). Summary of station and northern shrimp data collected on the 2001 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 23-August 4, 2001.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp(C)	Weight (kg)	Total No.	Total >=22 mm
*06-11	09	43 09	69 09	183	5.9	6.4	868	235
*06-12	24	43 20	69 22	177	5.8	15.1	2,271	560
07-01	02	42 17	69 11	214		0.0	0	0
07-02	01	42 13	69 18	207	7.4	2.1	204	153
07-03	05	42 26	69 06	236	7.3	0.3	38	18
*07-04	51	42 38	69 15	203	7.2	0.0	0	0
*07-05	04	42 27	69 04	221	7.3	1.2	146	70
07-06	03	42 18	69 11	218	7.5	3.9	433	286
*07-07	52	42 37	69 11	199	7.3	2.9	411	131
08-01	54	42 48	68 32	168	7.0	0.5	62	27
*08-02	06	42 54	68 41	199	7.3	0.0	0	0
08-03	13	42 60	68 42	183	6.9	6.4	738	338
08-04	14	43 12	68 45	170	6.8	3.6	440	191
08-05	53	42 47	68 59	177	6.3	7.7	1,202	411
08-06	16	43 30	68 39	141	7.0	5.3	542	303
08-07	15	43 25	68 34	154		1.1	113	65
*08-08	07	42 58	68 50	176	7.1	15.4	1,815	816
*08-09	17	43 33	68 49	132	7.1	8.4	862	589
09-01	56	42 23	68 48	199	7.0	1.0	122	66
*09-02	55	42 29	68 46	198	7.4	2.0	228	141
*12-01	57	42 10	68 49	172	6.1	3.9	445	266

* non-random tow

Table 2. Miscellaneous scientific collections made on the 2001 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 23-August 4, 2001.

Investigator & Affiliation	Samples Saved	Approximate Number
Aquarium, NMFS, NEFSC, Woods Hole, MA	Shrimp	5 bags
George Bolz, NMFS, NEFSC, Woods Hole, MA	Goosefish vertebrae	157 indiv.
Jason Link, NMFS, NEFSC, Woods Hole, MA	Goosefish stomachs	157 exam.
	White hake stomachs	35 exam.
Katherine Sosebee, NMFS, NEFSC, Woods Hole, MA	White hake otoliths	176 samples
	Thorny skate	8 indiv.
	Smooth skate	9 indiv.

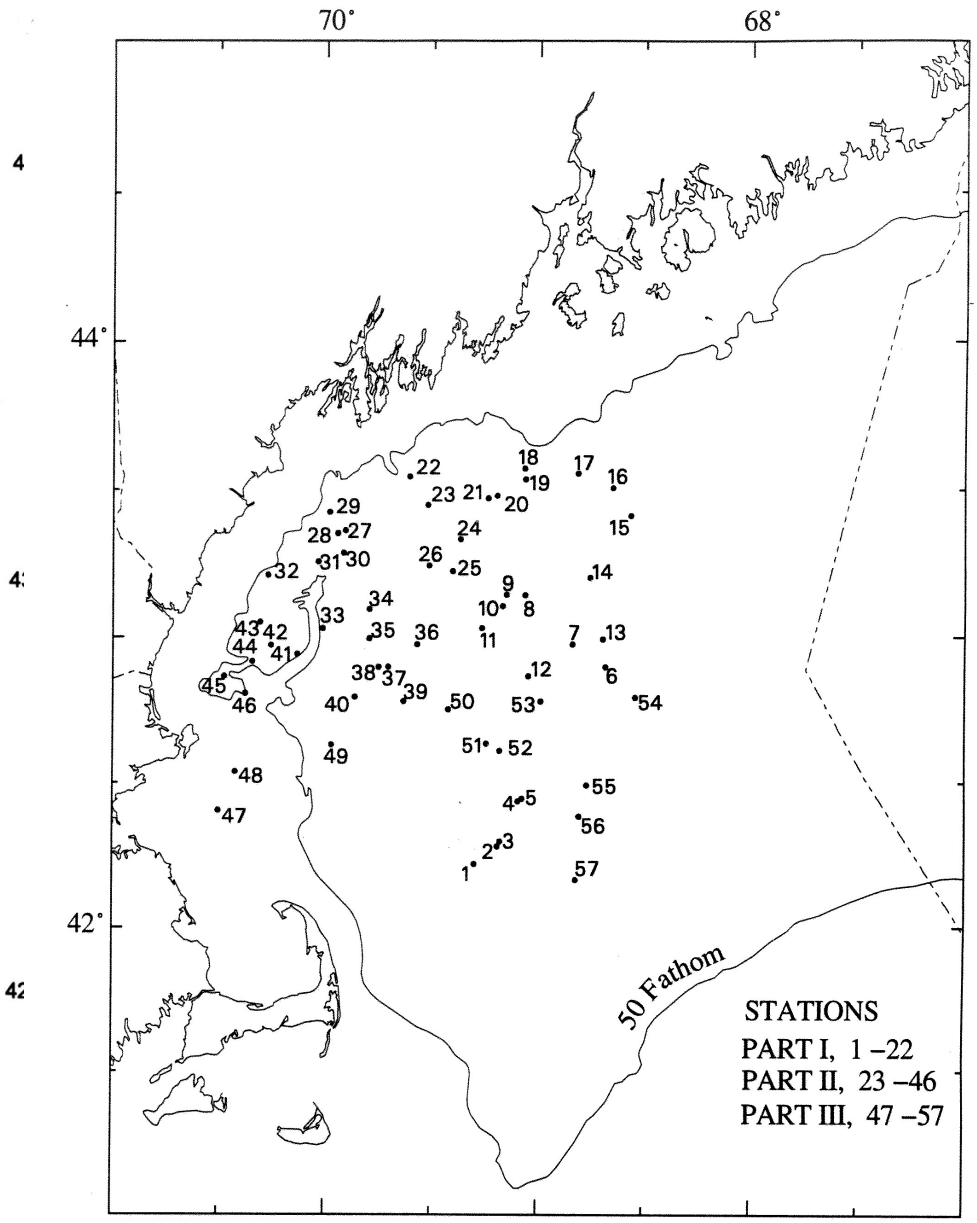

Figure 2. Trawl hauls made from the R/V GLORIA MICHELLE, during National Marine Fisheries Service, Northeast Fisheries Science Center summer northern shrimp survey (01-12), July 23-August 4, 2001.

Appendix I. Participants on the 2001 northern shrimp survey cruise in the western Gulf of Maine, aboard the R/V GLORIA MICHELLE, July 23-August 4, 2001.

National Marine Fisheries Service, NEFSC, Woods Hole, MA
Charles Keith, Chief Scientist, Part I - 23-27 July
Linda Despres, Chief Scientist, Part II - 28-31 July
Nancy McHugh, Chief Scientist, Part III - 1-4 August

National Marine Fisheries Service, NEFSC, Highlands, NJ
Fred Farwell, Lead Fisherman, I, II, III

NOAA Corps, Highlands, NJ
LT Scott Sirois, Commanding Officer, I, II, III
LTJG James Cronin, Executive Officer, I, II, III

MA Division of Marine Fisheries, Pocasset, MA
Matthew Camisa, III
Robert Glenn, I
Jeremy King, II

MA Division of Marine Fisheries, Boston, MA
Daniel McKiernan, II

MA Division of Marine Fisheries, Gloucester, MA
Holly McBride, III

ME Department of Marine Resources, West Boothbay Harbor, ME
Rochelle Creamer, I
Kohl Kanwit, II
Heidi Ryder, I
Alison Sirois, II
Jennifer Stankewitz, III
Angela Stilphen, III
Wayne Weeks, I
Lew White, III

Volunteers
Judith Angsten, II Augusta, ME
Stephen Clark, I Falmouth, MA